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THE GALL MIDGE FAUNA OF NEW ENGLAND.

By E. P. Felt,
Albany, N. Y.

The following list of New England Diptera referable to the Itonididæ has been made possible through the co-operation of a few individuals. Mr. C. W. Johnson and Mr. Owen Bryant have collected in various localities and generously placed their material at our disposal, while Miss Cora H. Clarke has been particularly successful in collecting galls and rearing the adults. The late Dr. M. T. Thompson made noteworthy additions to our knowledge of this group. In addition to the above we have referred to the list of insect galls prepared by Miss Stebbins.[1] This latter includes a considerable number of common species which have also been recorded or observed by other workers.

In view of the fact that nearly 900 species of gall midges are known to occur in America, it can hardly be claimed that the present list of 137 species exhausts the possibilities for New England, though it compares very favorably with the list of forms recorded by us from western North America,[2] a territory much larger and more diversified than that of New England. The similarities and differences in our knowledge concerning the fauna of these areas is well shown in the following tabulation.

[1] 1910, Stebbins, F. A. Springfield Mus. Nat. Hist. Bul. 2.

[2] 1912, Pomona College Journ. of Ent. 4:753–57.

AMERICAN SPECIES OF ITONIDIDÆ.

Subfamilies or tribes	North America	New England	Western North America
Lestremiinariæ	29	3	9
Campylomyzariæ	58	4	11
Heteropezinæ	13	2	0
Epidosariæ	70	6	4
Dasyneuriariæ	129	21	15
Lasiopterariæ	143	25	22
Oligotrophiariæ	86	16	20
Asphondyliariæ	67	16	21
Itonidinariæ	278	44	20
	873	137	122

A reference to the above table shows a fairly uniform tribal and subfamily representation in the known New England forms. A detailed examination of the list will show that much of our knowledge of Cincticornia and Caryomyia is due to the work of Miss Clarke. Comparing the New England fauna with that of the western part of the Continent, it will be noted that in the latter, both the Lestremiinariæ and the Campylomyzariæ exceed the New England forms by considerable, while no representative of the Heteropezinæ has been collected and there is a relatively small representation of the Itonidinariæ. Over half of the known American species have been reared. There is still an immense amount of work to be done along this line and in New England at least, one would expect judicious collecting to result in the discovery of at least a fairly rich fauna in both the Heteropezinæ and the Epidosariæ.

A considerable porportion of the many forms occurring on Salix and Solidago[3] should be found in New England.

In addition to the species tabulated below, there are some twenty-two names which have been applied to galls collected in New England and which probably represent undescribed forms. These latter names, some of which are valid, are given at the end of the list.

[3] Journ. Econ. Entom. 4:468–72.

LESTREMIINÆ.

Lestremiinariæ.

Catocha americana Felt, Franconia, N. H., Mrs. A. T. Slosson.
C. slossonæ Felt, Franconia, N. H., Mrs. A. T. Slosson.
Lestremia franconiæ Felt, Franconia, N. H., Mrs. A. T. Slosson.

Campylomyzariæ.

Prionellus dilatata Felt, Worcester, Mass., Dr. M. T. Thompson.
Monardia barlowi Felt, Kingston, R. I., Prof. John Barlow.
M. articulosa Felt, White Mountains, Morrison.
M. modesta sp. nov., New Haven, Conn., H. L. Viereck.

Heteropezinæ.

Miastor americana Felt, Connecticut, Prof. W. M. Wheeler.
Johnsonomyia rubra Felt, Montpelier, Vt., C. W. Johnson, June 1906.

ITONIDIDINÆ

Epidosariæ.

Didactylomyia longimana Felt, Auburndale, Mass., August 1906, C. W. Johnson.
D. capitata sp. nov., North Adams, Mass., August 1907, Owen Bryant.
Colpodia cornuta sp. nov., Jamaica Plain, Mass., October 31, 1910, Miss Cora H. Clarke.
Dirhiza montana Felt, White Mountains, Morrison.
Asynapta frosti sp. nov., Framingham, Mass., June 1, 1910, C. A. Frost.
A. nobilis sp. nov., Bridgeton, Me., August 25, C. W. Johnson.

Dasyneuriariæ.

Rhabdophaga salicifolia Felt. Thickened, greenish midrib fold on Spiræa. Magnolia, Mass., Miss Cora H. Clarke.
R. batatas Walsh. Irregular, ovoid or subglobular twig gall on willow. Springfield, Mass., Miss F. A. Stebbins.
R. strobiloides Walsh. Pine cone gall on willow, common in New England.
R. brassicoides Walsh. Large, open, rosette or cabbage gall on willow. Springfield, Mass., Miss F. A. Stebbins.
R. gnaphaloides Walsh. Ovate, terminal bud gall on willow. Springfield, Mass., Miss F. A. Stebbins.

Dasyneura trifolii Loew. Apposed, deformed, discolored leaflets of sweet clover. Stowe, Mass.

D. cyanococci Felt, Stowe, Mass., apical bud gall on blueberry.

D. clematidis Felt. Irregular, subglobular bud gall on Clematis. Springfield, Mass., Miss F. A. Stebbins.

D. parthenocissi Stebb. Thickened midrib or vein fold on Virginia creeper. Springfield, Mass., Miss F. A. Stebbins.

D. gleditschiæ O. S., New Haven, Conn., on honey locust, June 1904, B. H. Walden.

D. americana nom. nov. (*D. galii* Felt) Magnolia, Mass. Flower bud galls on bedstraw, Miss Cora H. Clarke.

D. corticis Felt, Boston, Mass. Small willow twigs, Miss Cora H. Clarke.

D. seminivora Beutm. Irregular, deformed fruit of violet. Springfield, Mass., Miss F. A. Stebbins.

D. salicifolii Felt, Magnolia, Mass. Young terminal adherent willow leaves, Miss Cora H. Clarke.

D. ulmea Felt. Aborted elm buds, Jamaica Plain, Mass., J. G. Jack.

D. gaylussacii Felt. Oval, valved midrib gall on cranberry. Springfield, Mass., Miss F. A. Stebbins.

D. radifolii Felt, Magnolia, Mass. Oval galls on root leaves of Solidago, Miss Cora H. Clarke.

D. aromaticæ Felt, Barre, Mass. Sprigs of mint, Miss Cora H. Clarke.

D. toweri Felt, Magnolia, Mass. Enlarged flower buds of *Hypericum mutilum*, Miss Cora H. Clarke.

D. serrulatæ O. S. Apical bud gall on alder. Springfield, Mass., Miss F. A. Stebbins.

Cystiphora viburnifolia Felt, Magnolia, Mass. Blister leaf galls on hobblebush, Miss Cora H. Clarke.

Lasiopteriariæ.

L. vitis O. S. Irregular, tumid, greenish or reddish leaf or tendril gall on grape. Springfield, Mass., Miss F. A. Stebbins.

L. corni Felt. Yellowish, purple-margined, blister gall on *Cornus stolonifera*. Springfield, Mass., Miss F. A. Stebbins.

L. clavula Beutm. Clavate apical twig gall on flowering dogwood. Springfield, Mass., Miss F. A. Stebbins.

L. impatientifolia Felt. Tumid midrib fold on balsam or jewelweed. Springfield, Mass., Miss F. A. Stebbins.

L. querciperda Felt. Subcortical swellings on white oak twigs. New Haven, Conn., A. B. Champlain.

L. farinosa Beutm. Warty, pruinose leaf gall on blackberry. Springfield, Mass., Miss F. A. Stebbins.

L. nodulosa Beutm. Irregular, subcortical stem gall on blackberry. Springfield, Mass., Miss F. A. Stebbins.

L. galeopsidis Felt., Boston, Mass. Irregular stem galls on hemp nettle, Miss Cora H. Clarke.

L. virginica Felt, Magnolia, Mass. Stem galls on Marsh St. Johnswort, Miss Cora H. Clarke.

L. convolvuli Felt. Fusiform stem gall on hedge bindweed. Springfield, Mass., Miss F. A. Stebbins.

L. cylindrigallæ Felt. Long, uniform stem swelling on solidago. Mount Tom, Mass., Dr. J. R. Gillett.

L. solidaginis O. S. (*tumifica* Beutm.) Irregular or eccentric stem gall on solidago. Worcester, Mass. Dr. M. T. Thompson.

L. clarkei Felt, Magnolia, Mass. Whitish, circular blister gall on *Aster macrophyllus*, Miss Cora H. Clarke.

L. spiræfolia Felt. Yellowish brown, blister gall on *Spiræa salicifolia*. Magnolia, Mass., Miss Cora H. Clarke.

Neolasioptera vitinea Felt, Worcester, Mass. An obpyriform conical, slightly curved petiole gall on grape, Dr. M. T. Thompson.

N. sambuci Felt, Worcester, Mass. Irregular stem gall on elder, Dr. M. T. Thompson.

N. perfoliata Felt, Worcester, Mass. Stem gall on boneset, Dr. M. T. Thompson.

N. ramuscula Beutm., Worcester, Mass. Fusiform stem gall on aster, Dr. M. T. Thompson.

Asteromyia vesiculosa Felt, Magnolia, Mass. Oval swellings in aster leaves, Mrs. H. M. Tower.

A. carbonifera Felt. Oval, black blister gall on *Salix graminifolia*, Springfield, Mass., Miss F. A. Stebbins.

A. dumosæ Felt, Annisquam, Cape Ann, Mass. Inconspicuous blister leaf gall on aster, Miss Cora H. Clarke.

A. asterifoliæ Beutm. Yellowish white, dark-margined blister leaf gall on aster. Springfield, Mass., Miss F. A. Stebbins.

A. flavolunata Felt. Marginal stem, oval, yellowish blister gall on *Solidago canadensis*. Springfield, Mass., Miss F. A. Stebbins.

Clinorhyncha filicis Felt, Magnolia, Mass. Apparently reared from galls of *Hormomyia verruca* Walsh, Miss Cora H. Clarke.

Camptoneuromyia rubifolia Felt, Magnolia, Mass. Marginal leaf galls on high blackberry, Miss Cora H. Clarke.

Oligotrophiariæ.

Phytophaga rigidæ O. S. Apical, fusiform, beaked gall on willow. Springfield, Mass., Miss F. A. Stebbins.

Janetiella asplenifolia Felt, Worcester, Mass. Fleshy leaf fold near midvein of sweet fern leaves, Dr. M. T. Thompson.

Rhopalomyia clarkei Felt, Tamworth, N. H. Small, fusiform gall on Solidago leaves, Miss Cora H. Clarke.

R. hirtipes O. S. Worcester and Springfield, Mass. Globose rootstalk and apical stem galls, Dr. M. T. Thompson and Miss F. A. Stebbins.

R. racemicola O. S. Springfield, Mass. Greenish or reddish, subglobular flower bud gall on solidago, Miss F. A. Stebbins.

R. solidaginis Loew., Springfield, Mass. Apical, globular, rosette gall on solidago, Miss F. A. Stebbins.

R. anthophila O. S. Green, densely, pubescent, cylindric flower gall on solidago. Springfield, Mass., Miss F. A. Stebbins.

R. lateriflori Felt. Axillary bud gall on *Aster lateriflorus*. Springfield, Mass., Miss F. A. Stebbins (*gemmaria*).

R. thompsoni Felt, Worcester, Mass. Globular or ovoid root stalk gall on Solidago, Dr. M. T. Thompson.

R. astericaulis Felt, Worcester, Mass. Oval twig gall on aster, Dr. M. T. Thompson.

R. pedicellata Felt. Green, red-marked, fusiform, stemmed leaf gall on narrow-leaved solidago. Springfield, Mass., Miss F. A. Stebbins (*euthamiæ*).

R. bulbula Felt, Worcester, Mass. Small bulb-like galls on Solidago, Dr. M. T. Thompson.

R. castaneæ Felt, Stowe, Mass. Leaf petiole of chestnut.

R. ? strobiligemma Stebb. Apical or axillary, ovate bud gall on white heath aster. Springfield, Mass., Miss F. A. Stebbins.

Sackenomyia virburnifolia Felt, Magnolia, Mass. Purplish vein swellings on Viburnum, Miss Cora H. Clarke.

S. packardi Felt, Canton, Mass. Swollen twigs of the long-leaved willow, Winthrop Packard.

Asphondyliariæ.

Asphondylia monacha O. S., Barre, Mass. Apparently unmodified Solidago florets, small, apical rosette galls and adherent leaves, Miss Cora H. Clarke.

A. thalictri Felt, Magnolia, Mass. Distorted seed capsules of Thalictrum, Miss Cora H. Clarke.

A. ? diervillæ Felt. Distorted fruit of bush honeysuckle. Springfield, Mass., Miss F. A. Stebbins (*inaequalis*).

A. conspicua O. S. Irregular, subglobular apical gall on cone flower. Westville, Conn., Dr. W. E. Britton.

Schizomyia pomum Walsh & Riley. Green or reddish, nut-like, polythalamous bud gall on grape. Springfield, Mass., Miss F. A. Stebbins.

S. coryloides Walsh & Riley. Clustered, fusiform, woolly, pubescent bud gall on grape. Springfield, Mass., Miss F. A. Stebbins.

Cincticornia serrata Felt, Boston, Mass. Circular blister galls on scarlet oak, Miss Cora H. Clarke.

C. caryæ Felt, Worcester, Mass. Probably reared from oak leaf gall by Dr. M. T. Thompson.

C. pustulata Felt, Magnolia, Mass. Pustulate swellings on leaves of black oak, Miss Cora H. Clarke.

C. simpla Felt, Magnolia, Mass. Oval, blister galls on oak leaves, Miss Cora H. Clarke.

C. podagræ Felt, Magnolia, Mass. Narrow, fusiform vein swellings on black oak leaves, Miss Cora H. Clarke.

C. globosa Felt, Magnolia, Mass. Subhemispheric galls on black oak leaves, Miss Cora H. Clarke.

C. pilulæ Walsh, Worcester, Mass. Reddish brown, thick-walled galls on oak leaves, Dr. M. T. Thompson.

C. sobrina Felt, Worcester, Mass. Reared by Dr. M. T. Thompson, probably from oak leaves.

C. connecta Felt, Westville, Conn., Dr. W. E. Britton.

C. pustuloides Beutm. Blister or pustule galls on scarlet and black oak leaves. Springfield, Mass., F. A. Stebbins.

Itonidinariæ.

Contarinia spiræina Felt, Magnolia, Mass. Bud galls on Spiræa, Miss Cora H. Clarke.

C. pyrivora Riley, Meriden, Conn., Coe Brothers.

C. setigera Lintn., Lowell, Mass. Reared from melon tips.

C. virginianiæ Felt. Swollen, deformed fruit of wild cherry. Stowe, Mass.

Thecodiplosis dulichii Felt, Magnolia, Mass. Fruit of Dulichium, Miss Cora H. Clarke.

T. liriodendri O. S., Boston, Mass. Ocellate leaf galls on tulip, Mr. J. G. Jack.

Dicrodiplosis fulva sp. nov., Jamaica Plain, Mass. Leaf galls on oak identified as those of *Neuroterus umbilicatus*, Miss Cora H. Clarke.

D. antennata Felt, Orono, Me. Larvæ preying on false maple scale, *Phenaccocus acericola* King, Dr. O. A. Johannsen.

D. helena Felt, Magnolia, Mass. Subglobular galls on poplar leaves, Miss Cora H. Clarke.

Youngomyia umbellicola O. S. Swollen, unopened florets of elder. Springfield, Mass., Miss F. A. Stebbins.

Aphidoletes cucumeris Lintn., Lowell, Mass. Reared from lice-infested melon tips.

Lobodiplosis acerina Felt, Brookline, Mass. C. W. Johnson.

L. quercina Felt, North Adams, Mass., Owen Bryant.

L. speciosa sp. nov. North Adams, Mass., August 1907, Owen Bryant.

Coquillettomyia bryanti sp. nov., North Adams, Mass., August 1907, Owen Bryant.

C. dentata Felt, Greylock Mountain, Mass., August 1907, Owen Bryant.

Clinodiplosis caulicola Coq., Portsmouth, N. H. Stems of Iceland poppies, D. W. Coquillett.

Caryomyia arcuaria Felt. Smooth, thin-walled hickory leaf gall. Worcester, Mass., Dr. M. T. Thompson.

C. caryæ O. S. Nearly smooth, thin-walled, yellowish green or brown, usually slightly nippled hickory leaf gall. Springfield, Mass., Miss F. A. Stebbins.

C. inanis Felt. Thin-walled hickory leaf gall with false chamber at the apex. Worcester, Mass., Dr. M. T. Thompson.

C. persicoides Beutm. Thick-walled, globose hickory leaf gall with short, curly hairs. Springfield, Mass., Miss F. A. Stebbins.

C. holotricha O. S. Thin-walled, globose hickory leaf gall with rather long, rust-red hairs. Springfield, Mass., Miss F. A. Stebbins.

C. caryœcola O. S. Conical hickory leaf gall with a long, slender apical process. Springfield, Mass., Miss F. A. Stebbins.

C. sanguinolenta O. S. Conical, short, thin-walled hickory leaf gall. Springfield, Mass., Miss F. A. Stebbins.

C. tubicola O. S. Cylindric or tubular hickory leaf gall. Worcester, Mass., Dr. M. T. Thompson.

C. thompsoni Felt, Worcester, Mass. Hickory leaf gall, Dr. M. T. Thompson.

Hormomyia shawi sp. nov., Hampton, N. H., S. A. Shaw.

H. canadensis Felt, Magnolia, Mass. Woolly, lipped gall on shadbush leaves, Miss Cora H. Clarke.

H. johnsoni Felt, Auburndale, Mass., C. W. Johnson.

H. clarkei Felt, Magnolia, Mass. Terminal bud gall on Spiræa, Miss Cora H. Clarke.

H. verruca Walsh, Magnolia, Mass. Subconic, clustered galls on willow leaves, Miss Cora H. Clarke.

H. cincta Felt, Hampton, N. H., S. A. Shaw.

H. modesta sp. nov., Auburndale, Mass., C. W. Johnson, New Haven, Conn., B. H. Walden.

H. pudica sp. nov., Hampton, N. H., S. A. Shaw.

Monarthropalpus buxi Lab., Kingston, R. I. Blister galls on Box leaves, Prof. E. A. Stene.

Hyperdiplosis bryanti sp. nov., North Adams, Mass., August 1907, Owen Bryant.

Parallelodiplosis spiræ Felt, Magnolia, Mass. Marginal roll on leaves of Spiræa, Miss Cora H. Clarke.

P. cattleyæ Moll., South Natick, Mass. Roots of Cattleya, A. P. Morse.

P. clarkei Felt, Magnolia, Mass. Narrow apical bud galls, on Spiræa, Miss Cora H. Clarke.

Itonida canadensis Felt, Magnolia, Mass. Woolly, oval vein galls on shadbush leaves, Miss Cora H. Clarke.

I. spiræina Felt, Magnolia, Mass. Bud galls on Spiræa, Miss Cora H. Clarke.

I. foliora Rssl. & Hkr., Amherst, Mass. Marginal leaf roll on oak leaves.

I. reflexa sp. nov., Hampton, N. H., S. A. Shaw.

I. rigidæ Pack., Springfield, Mass., Miss F. A. Stebbins.

A number of galls from which adults have not been reared have been recorded from New England. These deformities have been described and named as follows:

Cecidomyia bedeguar Walsh, *celastri* Stebb., *citrina* O. S., *crotalariæ* Stebb., *eupatoriforæ* Beutm., *impatientis* O. S., *lappa* Stebb., *majalis* Bass., *muscosa* Stebb., *niveipila* O. S., *ocellaris* O. S., *pellex* O. S., *poculum* O. S., *potentillæcaulis* Stebb., *pudibunda* O. S., *racemi* Stebb., *reniformis* Stebb., *serotinæ* O. S., *squamulicola* Stebb., *tuba* Stebb., *venæ* Stebb., and *verrucicola* O. S.

A number of unnamed galls undoubtedly exist in New England territory.

Descriptions of New Species Listed Above.

Monardia modesta sp. nov.

This small midge was taken by Mr. H. L. Viereck at New Haven, Conn., November 4, 1903. It is closely allied to *M. alexanderi* Felt from which it may be separated by colorational characters, the more slender antennal segments and the equal third and fourth palpal segments.

Female. Length, .75 mm. Antennæ hardly extending to the base of the abdomen, thickly haired, fuscous yellowish; 12 segments, the fifth pyriform, with a length one-fourth greater than its diameter and a short, though distinct stem; terminal segment fused with the preceding. Palpi, the third and fourth segments equal. Body a nearly uniform brownish black. Legs mostly fuscous yellowish; claws slender, evenly curved, the pulvilli as long as the claws. Ovipositor lobes triarticulate, the basal segment irregular, trapezoidal, the second quadrate, with a length two and one-half times its width, the third narrowly oval, setose apically. Type: Cecid. 1468.

Asynapta nobilis sp. nov.

The female described below was received from Mr. C. W. Johnson of the Boston Society of Natural History and labeled Bridgeton, Me., August 25. It is easily destinguished from other species of this genus by the long stems of the flagellate antennal segments.

Female. Length, 3.5 mm. Antennæ nearly as long as the body, sparsely haired, dark brown, the stems white; sixteen segments, the fifth with a stem three-fourths the length of the cylindric basal enlargement, which latter has a length twice its diameter and is ornamented with very irregular, reticulate, stout circumfili; terminal segment produced, with a length about four times its diameter, the distal fifth tapering. Palpi; first segment with a length four times its diameter, the second a little longer, broader, the third longer than the second, more slender, the fourth one-half longer than the third, slightly dilated. Mesonotum yellowish brown. Scutellum and postscutellum yellowish. Abdomen sparsely haired, yellowish red. Halteres and coxæ mostly fuscous yellowish, the legs mostly fuscous straw, except the two distal tarsal segments of the anterior and mid legs and the distal three of the posterior legs which are yellowish white; claws slender, strongly curved, unidentate, the pulvilli rudimentary. Ovipositor nearly as long as the body, the terminal lobes triarticulate, the basal subtriangular, the middle subquadrate, the terminal narrowly oval, sparsely haired. Type: Cecid. 1464.

Asynapta frosti sp. nov.

The female described below was received from Mr. C. W. Johnson of the Boston Society of Natural History and bore the following label "Found in jar of sumac twigs and bees nest, C. A. Frost, Framingham, Mass., VI–1, 10." It is easily distinguished from all other known American females by the number of antennal segments. Since the abdomen was recurved dorsally, this species may possibly be referable to the genus Ruebsaamenia Kieff.

Female. Length, 1.5 mm. Antennæ extending to the fourth abdominal segment, sparsely haired, dark brown; twenty-two subsessile, cylindric segments, the fifth with a length three-fourths greater than its diameter; terminal segment slightly produced. Palpi; first segment long, slender, second as long as the first, broader, the third fully one-half longer than the second, the fourth about one-half longer than the third, more slender. Mesonotum shining dark brown. Scutellum fuscous yellowish, postscutellum darker. Abdomen thickly haired, whitish yellow. Wings hyaline, costa light straw. Halteres pale straw basally, fuscous apically. Coxæ pale straw. Legs mostly dark straw, posterior tarsi light straw; claws moderately long, stout, unidentate, the pulvilli as long as the claws. Ovipositor long, slender, recurved dorsally, the terminal lobes slender, biarticulate, the basal segment with a length fully four times its width, the distal segment more slender, narrowly elliptical. Type: Cecid. 1424.

Lobodiplosis speciosa sp. nov.

This remarkable male was taken by Owen Bryant, August, 1907, at North Adams, Mass., and may be easily separated from its allies by the two subapical lobes on the basal clasp segment.

Male. Length, 1 mm. Antennæ twice the length of the body, thickly haired, light brown; fourteen segments, the fifth having the basal portion of the stem with

a length one-half greater than its diameter, the distal part with a length two and one-half times its diameter, the distal enlargement constricted at the basal third and with a length nearly twice its diameter; terminal segment, the basal stem with a length five times its diameter, the distal enlargement irregular, with a length three times its diameter and an irregular, fingerlike process equally long. Palpi; first segment irregularly subquadrate, the second nearly twice the length of the first, the third, one-third longer than the second, the fourth, one-half longer than the third, more slender. Mesonotum dark brown. Scutellum and postscutellum fuscous yellowish. Abdomen thickly haired, yellowish brown. Halteres and legs mostly pale straw, the distal tarsal segments somewhat darker; claws slender, evenly curved, anterior unidentate, the pulvilli rudimentary. Genitalia fuscous yellowish; basal clasp segment broad, with a broad subquadrate, subapical, glabrous lobe and apically a tapering, spined lobe; terminal clasp segment long, slender; dorsal plate short, broadly and triangularly emarginate, the lobes tapering to a narrowly rounded, setose apex; ventral plate narrow, long, broadly rounded and thickly setose apically; style long, tapering. Type: Cecid. 1454.

Coquillettomyia bryanti sp. nov.

The midge described below is easily separated from its allies by the broad, white annulations on the tarsi. It was taken by Owen Bryant, August, 1907, at North Adams, Mass.

Male. Length, 1.25 mm. Antennæ probably twice the length of the body, sparsely haired, fuscous yellowish; fourteen segments, the fifth having the stems with a length three and one-half and four and one-half times their diameters, respectively; distal enlargement with a length twice the diameter and a marked constriction near the basal third. Palpi; the first segment with a length three times its diameter, the second a little longer, stouter, the third slightly longer than the second and the fourth, one-half longer than the third, somewhat dilated. Mesonotum reddish brown, the submedian lines, scutellum and postscutellum fuscous yellowish. Abdomen yellowish brown. Halteres yellowish. Legs mostly dark brown, the first tarsal segment and the base of the second, white, the latter and third and fourth broadly annulate with white apically, the fifth white; claws slender, strongly curved basally, the anterior unidentate, the pulvilli about half the length of the claws. Genitalia; basal clasp segment stout, with a short emarginate lobe basally, the margin heavily chitinized; terminal clasp segment slender; dorsal plate short, broad, broadly and slightly emarginate; ventral plate short, tapering, broadly emarginate. Harpes produced as free, strongly recurved, heavily chitinized processes.

Female. Length, 1.25 mm. Antennæ about as long as the body, sparsely haired, fuscous yellowish; fourteen segments, the fifth with a stem about three-fourths the length of the cylindric basal enlargement, which latter has a length two and one-half times its diameter; basal portion of the distal segment cylindric, with a length four times its diameter and apically with a process as long as the enlargement and distinctly swollen at the basal fourth. Mesonotum brownish red. Abdomen brownish yellow. Ovipositor short, the lobes irregularly ovate and thickly setose, other characters practically as in the male. Type: Cecid. 1452, 1453.

Hormomyia shawi sp. nov.

This midge was received from C. W. Johnson of the Boston Society of Natural History and labeled: "VIII–20, 1909 Hampton, N. H., S. A. Shaw 1187." It is allied to *H. consobrina* Felt, from which it is easily separated by coloration and the extremely slender second palpal segment.

Male. Length, 3.5 mm. Antennæ as long as the body, thickly haired, pale yellowish; 15 segments, the fifth having the stems with a length one-half and one-fourth greater than their diameters, respectively. The distal enlargement subcylindric, with a length fully half greater than its diameter; terminal segment rudimentary, subglobose. Palpi; first segment stout, with a length about twice its width, the second extremely long and slender, it having a length more than 10 times its diameter. Mesonotum light yellowish orange, submedian lines indistinct. Scutellum and postscutellum yellowish orange. Abdomen thickly haired, pale yellowish, the basal segment and genitalia yellowish orange. Wings hyaline, costa light straw. Halteres yellowish basally, fuscous apically. Coxæ yellowish orange; legs a nearly uniform dark straw; claws slender, evenly curved, the pulvilli rudimentary. Genitalia; basal clasp segment narrowly oval; terminal clasp segment moderately short, stout; dorsal plate broad, roundly and triangularly emarginate, the lobes broadly and irregularly rounded; ventral plate long, broad, subtruncate, slightly emarginate, both sparsely setose. Type: Cecid. 1423.

Hormomyia modesta sp. nov.

This species was taken at Auburndale, Mass., May 22, by Mr. C. W. Johnson of Boston. It may be recognized by the dark brown abdomen and the fourteen cylindric antennal segments, the fifth with a length two and one-half times its diameter and with three circumfili.

Description. Female, Length, 4 mm. Antennæ sparsely haired, fuscous yellowish; fourteen segments, the fifth cylindric, with a length two and one-half times its diameter; sparse whorls of stout setæ occur basally and at the distal third; there are low circumfili near the basal third, the middle and apically; terminal segment slightly produced, with a distinct knob apically. Palpi; first segment short, second with a length three times its diameter, the third a little longer than the second, tapering. Mesonotum smooth, reddish brown, the yellowish submedian lines narrow. Scutellum pale yellowish, postscutellum yellowish, dark brown basally. Abdomen a nearly uniform shining dark brown; ovipositor pale orange; venter concolorous. Wings hyaline. Halteres yellowish basally, fuscous apically. Coxæ, femora and tibiæ mostly a light fuscous yellowish, tarsi fuscous yellowish or dark brown; claws stout, evenly curved, the pulvilli about one-third the length of the claws. Ovipositor short, the lobes broad, tapering to a broadly rounded apex. Type: Cecid. 1346.

Hormomyia pudica sp. nov.

The female described below was received through Mr. C. W. Johnson of the Boston Society of Natural History and labeled June 13, 1907, Hampton, N. H., S. A. Shaw, 1124. It is easily separated from other females having more than eighteen antennal segments, by the three circumfili and the long, uniarticulate palp.

Female. Length, 5 mm. Antennæ extending to the third abdominal segment, sparsely haired, fuscous yellowish, at least eighteen segments, the fifth with a stem about one-fourth the subcylindric basal enlargement, which latter has a length twice its diameter, is rather strongly constricted near the basal third and bears well developed circumfili basally, near the middle and apically. Palpi; the one long segment is distinctly swollen basally, the distal two-thirds being slender and the total length over one-half the width of the head. Mesonotum dark reddish brown. Scutellum and postscutellum fuscous yellowish. Abdomen mostly reddish brown. Halteres and legs mostly fuscous straw; claws long, evenly curved, the pulvilli about half the length of the claws. Ovipositor short, terminal lobes broadly oval, thickly setose, the ventral lobe roundly triangular. Type: Cecid. 1465.

Hyperdiplosis bryanti sp. nov.

This interesting male was taken by Owen Bryant, August, 1907 at North Adams, Mass.

Male. Length, 1 mm. Antennæ probably one-half longer than the body, sparsely haired, light straw; fourteen segments, the fifth having the stems three and three and one-half times their diameters, the circumfili moderately short. Palpi; first segment rather long, irregular, the second broad, with a length thrice its diameter, the third a little longer and more slender than the second, the fourth nearly as long as the third, somewhat dilated. Mesonotum reddish brown. Scutellum and post scutellum yellowish brown. Abdomen dark brown, the genitalia yellowish. Halteres mostly whitish, slightly fuscous apically. The legs mostly straw colored; claws strongly bent at right angles, simple, the pulvilli a little shorter than the claws. Genitalia; basal and terminal clasp segments moderately long, rather slender; dorsal plate short, deeply emarginate, the lobes apparently narrowly rounded; ventral plate greatly produced, deeply and roundly emarginate—in this specimen, irregularly so; style moderately long, stout. Type: Cecid. 1428.

Itonida reflexa sp. nov.

The male described below was received from Mr. C. W. Johnson of the Boston Society of Natural History and labeled: "I. B. 16, 1906, Hampton, N. H., S. A. Shaw, 1143." This species is easily separated from the allied *I. putrida* Felt by the dark brown abdomen and the somewhat longer antennal stems.

Male. Length, 2 mm. Antennæ as long as the body, thickly haired, dark brown; fourteen segments, the fifth having the stems with a length one and one-

fourth and one and three-fourths their diameters, respectively. Distal enlargement subcylindric, with a length one-fourth greater than its diameter; terminal segment, distal enlargement somewhat produced, irregularly fusiform. Palpi; first segment short, with a length one-half greater than its diameter, the second nearly twice the length of the first, the third a little longer than the second and the fourth three-fourths longer than the third, somewhat dilated. Mesonotum slaty gray, the grayish submedian lines sparsely haired. Scutellum and postscutellum dark gray. Abdomen thickly haired, dark brown. Wings hyaline, costa light straw. Halteres yellowish basally, fuscous apically. Coxæ and femora mostly fuscous yellowish; tibiæ and tarsi mostly dark brown; claws moderately stout, strongly curved, the pulvilli shorter than the claws. Genitalia; dorsal plate deeply and triangularly divided, the lobes narrowly triangular; ventral plate broad, broadly and roundly emarginate. Type: Cecid. 1422.

A VERNAL BEE (*COLLETES INÆQUALIS* SAY).

By John H. Lovell,
Waldoboro, Maine.

In Mr. Frost's interesting note on *Tricrania sanguinipennis* Say, which was published in Psyche, December, 1912, the name of the bee near whose burrows the beetles were found is given (through an inadvertence on my part) as *Colletes compactus* Cr., when it should be *C. inæqualis* Say. The two species, while bearing a general superficial resemblance, may be distinguished by the difference in the sculpturing of the enclosure on the metathorax or prepodeum; and by the fact that the former is an autumnal species and the latter a vernal species, some three months intervening between the disappearance of *C. inæqualis* and the appearance of *C. compactus*.

I have this season received both sexes from Mr. Frost, to whom I am indebted for the following notes. The bees were abundant, and had constructed numerous burrows near the base of a sloping embankment, about three feet high, sparsely covered with grass. There were also nests where the ground was level and free from vegetation. As the burrows appeared to be unlined and the soil was sandy it was impossible to follow the tunnels to a depth of more than three or four inches. This species of Colletes in New England is on the wing for about two months, and is most commonly taken on the aments of the willows. Mr. Frost captured

his first specimens on March 23, and on the 30th observed many visits to the flowers of Salix. On March 31 a female was seen looking out from the mouth of nearly every burrow, probably waiting for a warmer temperature, for on April 6, when there was a severe snow squall, no bees were seen flying about the burrows; and a few which had ventured to fly to the willows were numbed by the cold.

Swenk states that he examined a female from Durham, N. H., taken Oct. 5, 1899, and has also seen a few other autumnal specimens of *C. inæqualis*. He regards them as individuals appearing prematurely, which normally would not have come out until the following spring.[1]

Colletes compactus flies in New England from about the first of September to the middle of October. I most commonly find it on the inflorescence of the goldenrod, but have one specimen taken on the flowers of *Aster puniceus*.

THE LIFE HISTORY AND HABITS OF *SPALANGIA MUSCIDARUM* RICHARDSON, A PARASITE OF THE STABLE FLY.[2]

By Harry Pinkus.[3]

Bureau of Entomology, United States Department of Agriculture.

During the summer of 1912, while assisting in the study of the life history of the stable fly (*Stomoxys calcitrans* Linn.), at least two species of parasites were found breeding in large numbers in the puparia of this fly. These parasites belong to the family Pteromalidæ. One has been determined by Mr. C. H. Richardson as *Spalangia muscidarum* Richardson; the others have not been definitely identified. *S. muscidarum* was found most abundant while the other species appeared in smaller numbers. They appear to have similar breeding habits, although little has been done on the undetermined species.

During the investigation of the stable fly a lot of oat straw, placed in a pan and kept moist, was placed in the laboratory yard

[1] ("Specific Characters in the Bee Genus Colletes," Contributions from the Dept. of Ent., Univ. Neb., No. 1, p. 32.)

[2] Published by permission of the Chief of the Bureau of Entomology.

[3] Deceased August 27, 1913, at Dallas, Texas.

near the stable. When the straw began to decay stable flies visited it in large numbers, depositing thousands of eggs. In addition to the stable fly, a number of other species were found to be breeding in this rotting straw, such as Phoridæ, Chironomidæ and Anthomyidæ. No house flies (*Musca domestica* Linn.) or any other species of flies which commonly breed in dung were found although *Musca domestica* was present in the vicinity in considerable numbers. In a few weeks great numbers of Stomoxys larvæ of various sizes, as well as pupæ, were found in the straw. At this time a screened cage was placed over the pan in order to collect the flies as they emerged. Numbers of flies appeared daily for some time but the number was observed to diminish noticeably later. Upon examination of the straw the majority of the Stomoxys pupæ were found rather dark in color, some being almost black. When the cephalic ends of these pupæ were broken off in some cases the pupæ of parasites were found to be contained within, and in others the adult parasites came out as soon as the pupæ were broken. Considerable numbers of the Stomoxys pupæ were dead but no parasites were found within them. These pupæ were in the form of a soft, whitish, malodorous mass. The death of these pupæ appeared to be due, in part at least, to the parasites, as will be explained later.

Spalangia muscidarum Richardson appears to have a wide distribution. It has been bred from the house fly by Mr. C. H. Richardson, Jr., near Boston, Mass., as well as by Doctor L. O. Howard at Washington, D. C., from the same host. During this investigation, adults emerged on October 7, 1912, from Stomoxys pupæ collected by Mr. F. C. Bishopp at Gainesville, Texas on September 6, 1912. Other adults began emerging on October 26, 1912, from puparia collected by F. C. Bishopp and E. O. G. Kelly at Wellington, Kansas, on September 21, 1912, and others appeared on January 15, 1913 from puparia collected October 25, 1912 by F. C. Bishopp at Addis, Louisiana. Numbers have also been bred from pupæ collected at Denison, Texas, December 6, 1912. As has been pointed out, the parasite is undoubtedly very common in the vicinity of Dallas, Texas.

At Dallas the breeding was conducted both in the laboratory and out of doors. In the latter situation some adults emerged at

different times during the winter. These adults were killed when a temperature of 28° was reached on January 2, 1913. The immature stages, however, remained in perfect condition throughout the cold weather, and undoubtedly large numbers will emerge in the spring. In the laboratory, emergence continued throughout the winter. The greatest number appeared from pupæ kept in glass tubes in a well heated room. In another room, in which the temperature ranged somewhat lower, emergence was less rapid. At temperatures from 55 to 60° F. the adults became inactive. Breeding progresses well at 70° and somewhat higher temperatures increase all activities. Adults kept at 110° (in the dry atmosphere of an incubator) died very quickly.

Habits.

The adult parasites are scavengers in habit. In cages no prepared food is necessary for them. They prefer to feed on the remains of the host, and very often crawl back into the puparium and stay there for some time. While within the puparium they have been observed to feed upon the remains of the dipterous pupæ although honey and water were at hand. In no case did the adults pay much attention to artificial foods. They are seldom found anywhere except in and around the breeding places of their hosts. In flight the body is held in a vertical position with head up and wings extended horizontally. When disturbed, both sexes have the habit of "possuming." The legs are drawn together and the insect drops for a few seconds and then quickly resumes activity in order to escape. It appears that the parasites remain in one place as long as they have plenty of fly pupæ to parasitize. Probably dispersion takes place when the parasites become numerous and they do not have a sufficient number of hosts. It has been found that each female requires a considerable number of pupæ in which to deposit her eggs.

After the adults emerge from their pupal skins they have the habit of remaining within the puparia of the host for some time. During this period they gnaw more or less regular, circular holes through the puparia, but in many cases do not issue for some time after the emergence holes have been made.

Copulation takes place very shortly after emergence. The males are ever ready for mating. They seize the females and cling to their backs, caressing them with their antennæ for some time until the female exposes the ovipositor and copulation takes place. This act has been observed to take place a number of times at short intervals. Often two or three males endeavor to secure the attentions of the female at the same time.

Oviposition.

Spalangia muscidarum is a simple parasite[1] and does not usually deposit a second time in a single host. When a female finds a pupa she first makes a thorough examination with the antennæ and then fixes herself firmly on the pupa. She then begins to feel about on the pupa with the tip of the ovipositor, sometimes changing her position if the first spot attacked is too hard for penetration. The ovipositor is usually inserted near the cephalic end of the puparium, generally on a suture. While ovipositing, the female is not easily disturbed. In some cases the puparium may roll over and yet the parasite retains her position. The accompanying figure (Plate I fig. 1.) of the female in act of depositing was drawn from a photograph taken by Mr. H. P. Wood. About ten or fifteen minutes are required for the deposition of an egg.

Repeated efforts to induce the female to deposit an egg in a puparium which had already been deposited in were unsuccessful. In every case the female quickly recognized the fact that the puparium had already been attacked, and left it in search of other hosts. A female which was supplied with fresh pupæ as fast as oviposition took place was observed to deposit in fifteen different pupæ in succession. She would have, undoubtedly, deposited in many more pupæ had they been supplied, as she appeared strong and active after having laid these eggs. Subsequent examination of these fifteen puparia showed that immature parasites were developing in four and all of the others were dead, probably as the result of the insertion of the ovipositor. When numbers of puparia were supplied to parasites in cages, in only one case did an adult fly emerge, the others having succumbed to the attack of the parasites.

[1] Pierce: On some phases of parasitism displayed by insect enemies of weevils. Journ. Econ. Ent., vol. 3, p. 452, 1910.

The female will readily oviposit in many species of dipterous pupæ. Evidently it has no preference. In addition to *Stomoxys calcitrans* the following species have been parasitized experimentally: *Musca domestica* Linn., *Hæmatobia serrata* Desv., *Helicobia quadrisetosa* Coq. and *Pseudopyrellia cornicina* Fabr. In one test a number of puparia of different species of flies were mixed with those of *Stomoxys calcitrans* and all were put under a glass bell jar in the laboratory. A number of parasites were introduced and observations made in order to ascertain if any preference was shown. In this case, as well as when different pupæ were placed in small tubes with parasites, no discrimination between the different species was apparent.

In nature the stable fly is undoubtedly the principal host of the parasite. This is evidently due to the breeding habits of this fly. As has been stated, the stable fly breeds largely in rotting straw or manure which contains much straw. The loose texture of this material allows the parasites to gain access to the puparia with ease. On the other hand, the breeding habits of the species which have been found experimentally to act as hosts of this parasite, are quite different. For example, *Musca domestica*, *Hæmatobia serrata* and *Helicobia quadrisetosa* breed mainly in dung or other matter which is of compact texture. By the time the larvæ are ready to pupate the material in which they are breeding becomes quite compact. This prevents, to a great extent, the adult parasites from entering the substance in order to reach the host, except when the mass of breeding material is accidentally scattered or if some straggling specimens happen to pupate so as to be partially exposed. In nature this condition is not the rule, hence we find the parasite attacking most commonly those species which are readily reached.

Development.

The length of the developmental period of the parasite varies greatly, according to the temperature experienced. An egg (see Plate I fig. 2) which was probably of this species has been removed from the body of a fly pupa. A number of observations have been made to determine various points in the developmental period of the parasite.

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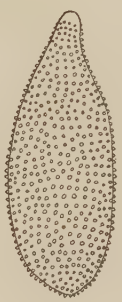

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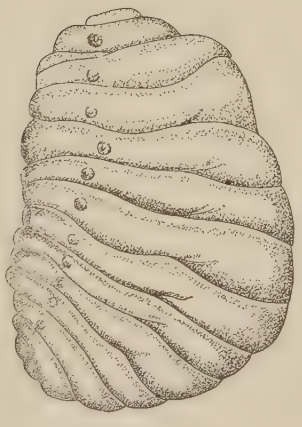

3.

Fig. 1. *Spalangia muscidarum* Richardson. Adult female ovipositing in puparium of *Stomoxys calcitrans* Linn. Fig. 2. Egg of *Spalangia muscidarum*. Fig. 3. Larva of *Spalangia muscidarum*. Fig. 4. Pupa of *Spalangia muscidarum*.

In one series, eggs were deposited on November 7, 1912 within the puparia of *Stomoxys calcitrans*. On November 12 one fly pupa was observed to have a minute larva feeding on its eye. On December 9 full-grown parasite larvæ (see Plate I, fig. 3) were found feeding on the exterior of fly pupæ within the puparia. One parasite pupa (see Plate I fig. 4) was also found on this date. January 30, 1913, one adult parasite emerged, thus having a total developmental period of 84 days. During this period the average mean temperature was 56.58° F.

A number of puparia of *Musca domestica* were exposed to Spalangia adults November 3, 1912. On November 9 the parasites were observed to be ovipositing. In at least two of these the parasites were observed to have pupated when examined December 6. When again examined, on January 9, 1913, the pupæ were becoming black. Three adults had issued on or before February 20, 1913. In this test the total developmental period was less than 109 days. In another experiment, in which *Musca domestica* was used as a host, parasites were placed with the pupæ on November 12, 1912. Oviposition occurred at noon on this date. Full grown parasite larvæ were found on January 5, 1913, and on January 30, some had begun to pupate, thus having occupied 79 days in developing to the pupal stage at about the same temperature which prevailed in the above experiment where Stomoxys pupæ were used. One female parasite issued February 26, 1913, after a total developmental period of 106 days.

Parasites developed from the egg to the adult in 100 days in puparia of *Hæmatobia serrata*. In this test deposition took place on November 12, 1912. Pupation began January 30, 1913 and the first adult emerged February 20, 1913. This experiment was also conducted in the same room as the preceding experiments.

In another room in the laboratory, where the temperature was considerably higher, a number of puparia of various species were exposed to parasites on November 30, 1912. Pupation had begun January 30, 1913, or 61 days after eggs were deposited. This shows that the period from deposition to pupation was shortened 18 days by the higher temperature in which the developing parasites were kept. One adult female and one male emerged February 26, 1913 from a *Hæmatobia serrata* puparium. The total developmental period is therefore about 88 days.

Examinations of puparia kept out of doors during the winter of 1912–13 showed that a few adults emerged during warm weather but the majority of the immature stages appeared to continue developing very slowly and will probably not emerge until the advent of spring.

Methods of Artificial Propagation of Parasites of the Stable Fly.

As has been shown, the habits of the female parasites enable them to destroy a great number of fly pupa. Many of these pupæ are destroyed by the development of the young parasites and others died, apparently from injury caused by the insertion of the ovipositor. Circumstantial evidence also indicates that many fly pupæ are pierced by the ovipositor to cause juice to exude from the punctures for food for the parasites. This view is strengthened by the finding in nature of numerous Stomoxys puparia, the contents of which have completely dried up.

It would seem that if an adequate number of these parasites are present early in the season they would be quite effective in the control of the stable fly. However, under natural conditions it is reasonable to assume that in general there is seldom a sufficiently great number of parasites present to cope with Stomoxys, despite the fact that the fly generally occurs in small numbers early in the spring. The development of the stable fly is considerably slower than that of the house fly and as a consequence it seldom becomes sufficiently abundant to be very injurious until in the fall. The development of the parasites is slower than that of the stable fly, hence under natural conditions the parasites are unable to control it. However, late in the fall the parasite also becomes very abundant as breeding is facilitated by the great abundance of its hosts and the high temperature which prevails at that season. With the advent of cold weather the breeding of both the parasite and host is checked to a great extent and when fatal temperatures are reached nearly all of the adult parasites are killed without having had an opportunity to deposit in the fly puparia which are still present in rotting straw and other places. This condition allows many stable flies to continue to develop through the winter and appear as adults the following spring. Those which were in

the larval stage at the time the adult parasites were destroyed would be entirely exempt from attack as well as some of the pupæ which had not been reached up to that time. Of course the parasites which are in the immature stages would be protected by the same conditions which protect the host and they would pass the winter successfully and emerge along with the flies in the spring. However, their numbers would be much smaller than the stable fly at that time.

By artificial means it is possible to propagate these parasites in large numbers throughout the winter and liberate them early in the spring. By this procedure it might be possible to cut down to a great extent the first generation of flies and the continued development of the parasites during the spring and summer would tend to control the flies throughout the year. In addition to the destruction of the stable fly, house flies and other injurious species would also be attacked whenever the parasites are able to reach them.

Since Spalangia does not discriminate between various species of fly puparia the work of artificial propagation is greatly facilitated. The writer has found it best to collect the larvæ together with the manure or other substances in which they are breeding and after pupation has taken place to separate the pupæ and supply the parasites with them.

The writer has modeled a parasite breeding cage (Fig. 1) which he finds quite practical for the breeding of these parasites. In the construction of this cage an empty honey box (the container of comb honey) size 8 x 14 x $9\frac{1}{2}$ inches in height is used. Glass is closely fitted in the front and top and a hole four inches in diameter is cut in either end. Around the inside edge of each of these holes is tacked one end of a cuff of soft muslin cloth. These cuffs should be about nine inches in length, the outer end being gathered with an elastic so as to closely fit around the wrist of the operator when the hands are inserted into the box. When not in use the cuffs are closely tied with a string to prevent the escape of parasites. At the center of the bottom of the cage a hole one inch in diameter should be cut. The entire bottom of the cage, with the exception of the circular hole, is then covered with oil cloth to protect the wood from the moisture. On top of the oil cloth a

layer of white blotting paper is placed, completely covering the bottom of the cage. A narrow strip of this paper should be sewed to the large blotter in such a position as to extend through the hole in the bottom of the cage into a vessel beneath which contains

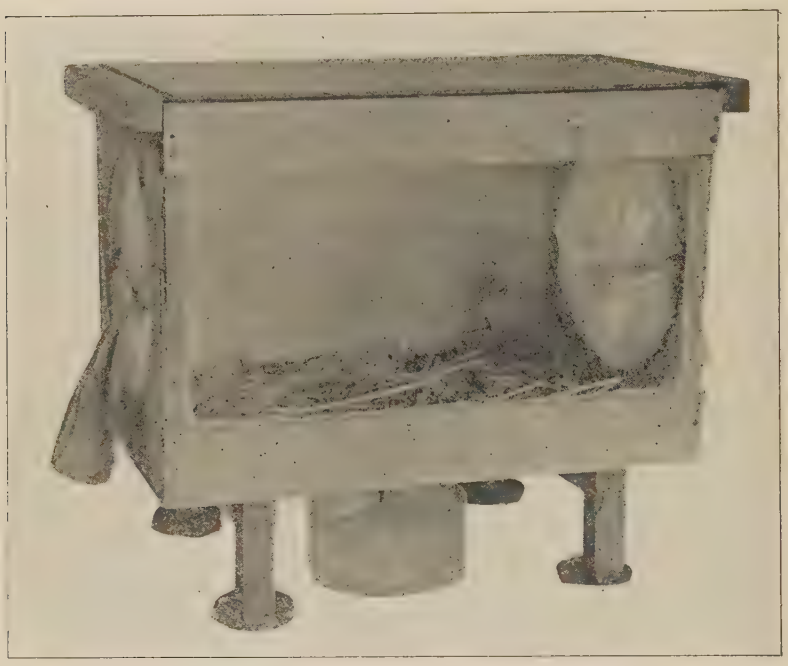

Fig. 1. Parasite breeding box (original).

water. The strip of blotter takes up the water from the container and keeps the large blotter which lies in the bottom of the cage moist at all times. Four legs of a convenient height are attached to the corners of the cage and placed in cups to keep away ants and mites. These legs were $3\frac{1}{2}$ inches long in the cage used in this work. A small amount of damp straw is then placed in the cage on the blotter.

When the cage is in readiness the parasites, either in the adult or pupal stage, are introduced. If adult parasites are put into the cage the pupæ from which they emerged should always accompany them in order to furnish protection and food. Unparasitized

pupæ should then be introduced from time to time to insure having an abundance of fresh material for the parasites to attack. It is very essential that the cage be kept in direct sunlight, for at least part of the day, and in a warm room. A temperature of 75 to 80° F. is desirable. In a week or two after the first pupæ have been exposed to the parasites they should be gathered together and placed in a separate place and more fresh pupæ added. The original stock of parasites should be secured by collecting puparia in localities where the parasites are known to occur in greatest numbers. Where great numbers of pupæ can be obtained they may be placed together. To facilitate the separation of the puparia from the material in which they pupated, and to eliminate the dead pupæ, they may be placed in a vessel of water. All of the living or parasitized pupæ float and may be removed with a section lifter or a skimmer. A parasitized pupa can be quite readily recognized by its being much darker than normal and by one side of the puparium appearing almost black while the other portion is somewhat translucent and of lighter color. These puparia should be placed in glass tubes containing a very humid atmosphere and kept in a warm room. As the parasites emerge they should be transferred into breeding boxes as described above.

When a sufficient number of parasites has emerged to proceed with breeding the other puparia parasitized in the cages should be examined. When it is found that most of the parasites are in the pupal stage the entire lot should be removed to a refrigerator or cold storage room in which the temperature is kept uniformly between 50 and 55° F. These temperatures check development and retard emergence a few weeks before it is planned to liberate the parasites in the field. The puparia should be removed from the refrigerator so they may complete their development. Parasites should always be liberated near barns or straw stacks where flies are known to be breeding.

The developmental period can be shortened greatly, probably less than half the time required in the experiments reported herein, by increasing the temperature under which they are propagated. Under natural conditions breeding must be greatly stimulated by the heat produced by rotting straw and manure which surround the parasitized puparia.

By the plan of artificial propagation herein outlined and liberation of large numbers of parasites early in the spring where it is desired to carry on a campaign against the stable fly, we can reasonably expect them to be an important factor in the control of this pest.

A NEW GENUS OF MALLOPHAGA.[1]

By John Howard Paine.

Bureau of Entomology, United States Department of Agriculture.

Through the kindness of the United States Biological Survey, the writer has been able to make a collection of Mallophaga from bird skins taken in Panama. Among the resulting specimens is a most curious form which is not referable to any of the known genera, and for which, therefore, the founding of a new genus becomes necessary.

Ancistrocephalus gen. nov.

A single male specimen was taken from the skin of a ground dove, *Chœmepelia rufipennis* (Rio Indio, Canal Zone, March 3, 1911). In this specimen the antennæ show but three segments, being most probably due to the loss of the terminal two. This is borne out by the fact that the tip of the third segment, under high magnification, appears unfinished, as though other segments had been attached. The genus therefore, having two-clawed tarsi, falls into the family *Philopteridæ*. Following are given the characters of the genus:

Small species with head broader than long and bearing extremely long hairs on the head and body; these hairs are the longest I have seen on any Mallophagan. Front broad, flattened, almost straight, with lateral angles produced into long, curved, heavily chitinized backward projecting hooklike appendages. Antennæ well developed, in the male at least, and arising from deep lateral emarginations, situated before the middle, affording a certain resemblance to some of the mammal infesting genera. Temples squarish, bearing extremely long hairs; occiput broad, almost straight. Abdomen broad, segments with posterior lateral angles produced into slightly curved, chitinized processes, giving the lateral edges of the abdomen a highly serrate appearance. Last segment in male entire.

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[1] Published by permission of the Chief of the Bureau of Entomology.

Ancistrocephalus kelloggi sp. nov. (Fig. 1.)

A single male specimen taken from the skin of a ground dove, *Chæmepelia rufipennis* (Rio Indio, Canal Zone, March 3, 1911)

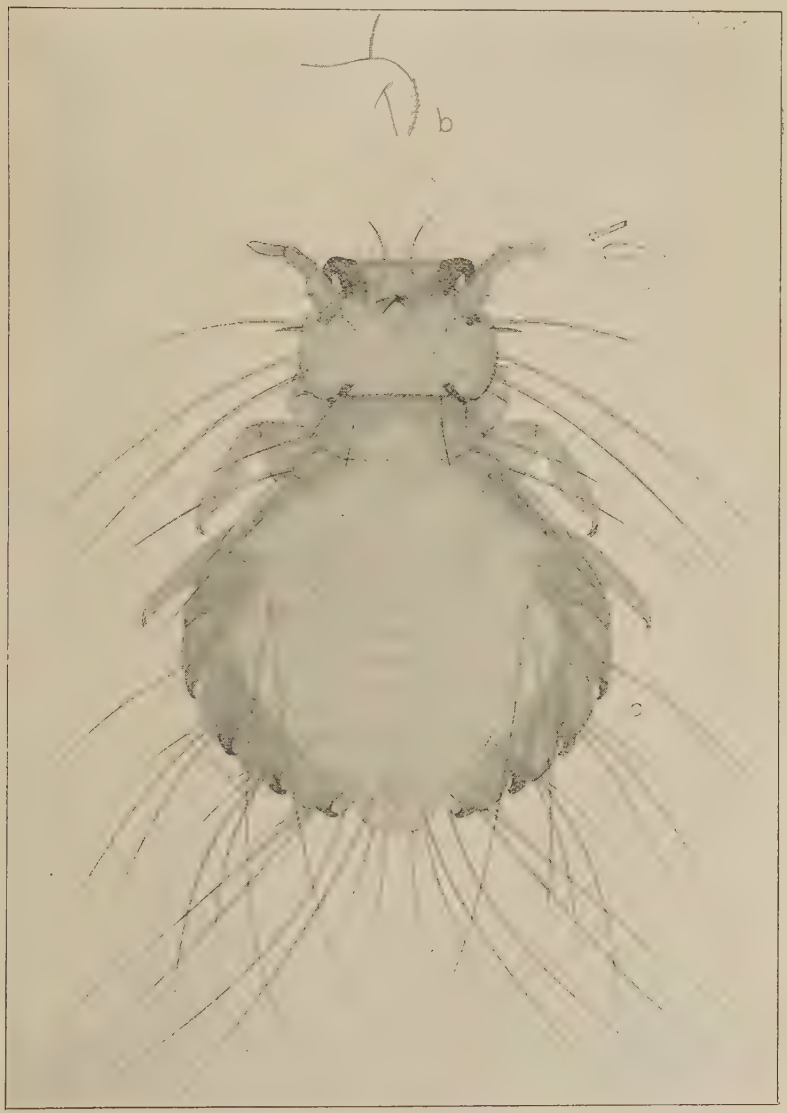

Fig. 1. *Ancistrocephalus kelloggi* sp. nov., male. *a*, dorsal view; *b*, anterior lateral angle of head; *c*, lateral spine on head.

in the collection of the Biological Survey, United States Department of Agriculture, at the National Museum. A minute species with short, broad body.

Description of male: Head two-thirds as long as broad. Front flattened, almost straight, set in between the prominent hook-like anterior lateral angles; these angles projecting forward slightly beyond the clypeal front, are heavily chitinized and bent backward to form sharp hooks with finely serrated outer margins (Fig. 1, *b*). Front between hooks with a narrow marginal band bearing four hairs on each side, the second from the center being the longest; also several hairs projecting from the ventral surface, not shown in the figure, and a hair on the anterior extremity of the lateral hooks. A hair on each side on the dorsal surface near the anterior margin, another in front of the antennæ and a longer one near the innner extremity of the lateral emarginations. Sides of head before the middle deeply emarginate for the reception of the antennæ. Antennæ long, first segment enlarged, about as long as the second, with third a little shorter and diminishing in thickness; last two segments missing. Antennal bands forming the basal marginal portion of the lateral hooks. Eyes indefinite, located on the anterior, forward projecting angles of the temples with a small occular fleck. Occular blotch small, colored. Temples squarish, but little rounded and slightly narrowing behind; one very long marginal hair just behind the eye and two still longer ones arising about half way back, these latter reaching onto the third segment of the abdomen; a short spine near the posterior angle, another between the two long hairs just mentioned, and a peculiar, long, heavy spine just behind the anterior hair (Fig. 1, *c*). Occiput broad, straight, with broadly separated occipital blotches; two hairs on each side, the outer, shorter one near the lateral angles of the head; occipital bands and signature absent.

Thorax long, slightly wider than head. Prothorax with sides straight, diverging, and posterior margin rounded at the sides but straight across the middle. Lateral angles probably with a long hair, broken off in the specimen at hand, leaving definite pustule. Metathorax quadrilateral with anterior lateral angles protruding, bearing two prominent pustules from which the hairs have been broken; this segment much narrower than the first segment of the abdomen and embraced by it, extending to its posterior margin and dividing it into two lateral, triangular portions; posterior margin of metathorax not visible. A dorsal hair on each side, midway between the anterior and posterior margins. Legs with femora broad, those of hind legs not projecting beyond the sides of the abdomen, their articulation being well in toward the meson; tibiæ long and narrow.

Abdomen circular, a little wider than long, widest at third segment, with broad lateral bands and faint transverse blotches. Posterior lateral angles of segments two to six produced into a chitinized, slightly in-curved appendage which extends inward and forward as an internal chitinized band to the anterior margin of the segment. First segment longest with uncolored, diverging sides; seventh segment much reduced, shorter than the preceding one and bearing a very long hair; last segment rounded, entire, bearing two very long hairs on the dorsal surface and four shorter ones on the posterior margin. Segments three to six with very long lateral hairs arising before the lateral appendages. An extremely long dorsal hair on the

posterior margin on each side of segments two and three, situated a short distance in from the lateral bands and extending far beyond the end of the body; others very small, occupying similar positions on segments four and five; these appear to be the only dorsal hairs. Genitalia with long, slender external appendages, not heavily chitinized.

	Measurements: ♂, length 1.000 mm.	Width
Head	.246	.344
Prothroax	.100	.278
Metathroax	.196	.360
Abdomen	.623	.754

NOTES ON THE DURATION OF THE PUPAL STAGE IN CERTAIN LEPIDOPTERA.

By Phil Rau.
St. Louis, Mo.

1. **Grapta interrogationes** Fab.

The larvæ of this insect were observed upon their food-plant, the hop vine, from the time of pupation to the time of emergence as adults, covering the period from August 28 to September 21, 1910. The duration of the pupal period was as follows:

Days.	No. of insects.
9	1
10	6
11	2
12	0
13	2

We see that in these eleven individuals this period varied from 9 to 13 days, in most of them 10 days. Mr. W. H. Edwards[1] finds that the duration of the pupal stage at Coalburgh, West Va., is from 7 to 11 days, a little shorter than at St. Louis.

2. **Samia cecropia** Linn.

The notes on three insects of this species are as follows:

Sex.	Date of pupating.	Date of Emerging.	Duration.
♂	7/20/'10	6/3/'11	318 Days.
♀	7/27/'10	6/5/'11	313 "
♀	7/15/'11	6/4/'12	324 "

[1] Can. Ent. Vol. XV. p. 204.

The cocoons were on trees, exposed to the natural weather conditions of St. Louis during the winter .

3. **Telea polyphemus** Cramer.

Four larvæ of this species taken in the woods spun their cocoons within three or four days after being caged, and emerged as follows:

Sex.	Pupated.	Emerged.	Duration.
♂	9/19/'10	5/12/'11	235 Days.
♀	9/22/'10	5/13/'11	233 "
♂	9/23/'10	5/16/'11	235 "
♂	9/27/'10	5/11/'11	226 "

At first glance the figures above seem to show that the insects emerged in the order in which they pupated, but in the fourth instance we see that the individual which was the last to pupate emerged as an adult before any of the others.

It would be of interest to record similar data from year to year from one or more localities, in an attempt to discover the causes underlying any variation in the duration of the pupal period, and to discover if the pupal duration is in any way correlated with the longevity of the imago. We have found in connection with other work that the pupal period of the Cecropia moth varied greatly under changed conditions of temperature and moisture.

St. Louis, Feb. 21, 1913.

NOTES ON VARIATION IN THE VENATION OF THE SPECIES OF THE GENUS LEPTOGASTER.

By Charles W. Johnson.

Boston Society of Natural History, Boston, Mass.

In The Entomologist for July, 1913, vol. 46, p. 213, under the title "A Fossil Asilid Fly from Colorado," Prof. T. D. A. Cockerell proposes *Tipulogaster* "a new subgenus (or genus?)" for the recent *Leptogaster badius* Loew, based on the following characters: "The anal cell is narrowed apically as in *L. hellii* but the second posterior cell is no more produced basally than in *Cophura*. This also has the second submarginal cell shorter than in the typical *Leptogaster*, while the distance between its base and the anterior

cross-vein is much greater." To one having a large series of *L. badius* or a large number of the species of *Leptogaster*, the attempt to make a genus or even a subgenus on such trivial characters shows that the author had very little material at his command and had no idea how variable these characters are even in the same species.

Anal cell. The fifteen specimens of *L. badius* before me show the following variations: twelve females have the anal cell narrowed but varying from *one* in which the cell is very narrow and almost closed on one wing, to others in which the outer portions of the veins are almost parallel; in two males they are parallel, as in the typical *Leptogaster*.

In *L. testaceus*, a closely related species, three have the venation as in *L. badius* and two have the anal cell closed. In *L. incisularis* Loew, the anal cell is only slightly narrowed at the margin. *L. annulatus* Say, *marinus* and *flavipes* Loew, *virgatus* Coq., *clavipes* and *obscuripennis* Johns., and *atrodorsalis* Back., all have the anal cell as in the type of the genus *L. cylindrica* DeG. (*L. tipuloides* Fabr.). On the other hand, in *L. brevicornis* and *pictipes* Loew, and *floridensis* Johns., the sixth longitudinal and the anal veins are widely divergent and consequently the anal cell is widest at the margin of the wing.

Second posterior and second submarginal cells. Here again we find all gradations between the type species and *L. badius*. *L. annulatus* and *atrodorsalis* which have typical anal cells, have the second posterior cells "less produced basally" than in *L. badius*; the former however, has a long second submarginal cell and the latter a short one. In *L. murinus*, *clavipes*, *obscuripennis* and *virgatus*, the base of the second posterior cell is produced almost as much as in *L. cylindrica* but the second submarginal cell is as short as in *L. badius*. In the species with broad anal cells, *L. pictipes* and *floridensis* have the second posterior cell scarcely produced basally, the former has, however, a short and the latter a long second submarginal cell, while in *L. brevicornis* the second posterior cell is strongly produced basally and the second submarginal cell is long. The variation in the length of the second posterior cell was pointed out by Dr. E. A. Back (Trans. Amer. Ent. Soc., XXXV, 157, 1909). In referring to what he terms the anterior intercalary

vein, he says: "In some species the venation mentioned is inclined to be variable in different or even in the same specimen."

Another variable character is referred to in Dr. Back's key to the species as "fourth posterior cell petiolate at the base or fourth posterior cell sessile or subsessile." *L. pictipes* may be either sessile, subsessile or with a short petiole. *L. annulatus* shows a similar variation although more rarely petiolate. One specimen of *L. pictipes* has the discal cell open on the left wing and another has an adventitious cross-vein in the second submarginal cell of the left wing. A specimen of *L. badius* and another referred doubtfully to *L. incisularis*, have a similar vein in the second posterior cell on the left and right wing respectively. An undetermined species has an adventitious cross-vein in each of the second posterior cells, and one in the second submarginal cell of the left wing. These examples are given to show possible mutations. The type of *L. badius* has the basal third of the wings subfuscus. This is only distinctly marked in one of the fifteen specimens.

THE LIFE HISTORY OF *THRYPTICUS MUHLENBERGIÆ* SP. NOV. (DIPTERA).

By O. A. Johannsen and C. R. Crosby.
Cornell University, Ithaca, N. Y.

On April 21, 1909, while examining some *Muhlenbergia sylvatica* on the shaded bank of Cascadilla Creek near the Cornell University Campus, Ithaca, N. Y., we noted that many of the stems were broken squarely off. The tip of the cavity was plugged with frass, and in each case a slender dipterous larva was found just below the plug. A number of these larvæ was taken from the straws and placed on cotton in a vial for rearing. By May 4, pupation has taken place. An adult fly was found alive on May 29. Again on May 5, 1910, similar pupæ were found in *Muhlenbergia* stems that had been collected about two weeks previous. Adults emerged from this material on May 24.

The flies were at first thought to be *T. willistoni* which they closely resemble, but subsequent study has convinced us that they are a new species. In order to get fresh material in all stages

upon which to base our descriptions, we again visited in April of the present year, the spot where the former specimens were found. From the larvæ then collected we reared three females and one male May 16-19, 1913. Nothing was learned of the eggs nor the manner of oviposition, but judging from the form of the ovipositor of the female it seems likely that the eggs are laid within the stem plant, probably in May, and that the larva remains thus within the stem until the time of pupation in April of the following year.

Larva (fig. 1). Length, 5½ to 6 mm. Peripneustic. Very pale amber yellow, pharyngeal skeleton dark brown. The combined head and thoracic segments somewhat conical in shape, not differentiated. Abdomen with nine illy defined segments, the anterior ones of greatest diameter, the intermediate longer than wide, anal segment with a prominence on the ventral side, each of the others with a ventral transverse band of ambulacral setulæ, each band consisting of 12 to 15 strong setulæ followed by 2 or 3 rows of more minute ones. The pharyngeal skeleton (figs. 2 and 3) consists of a transverse saddle-like structure anteriorly to which is a pair

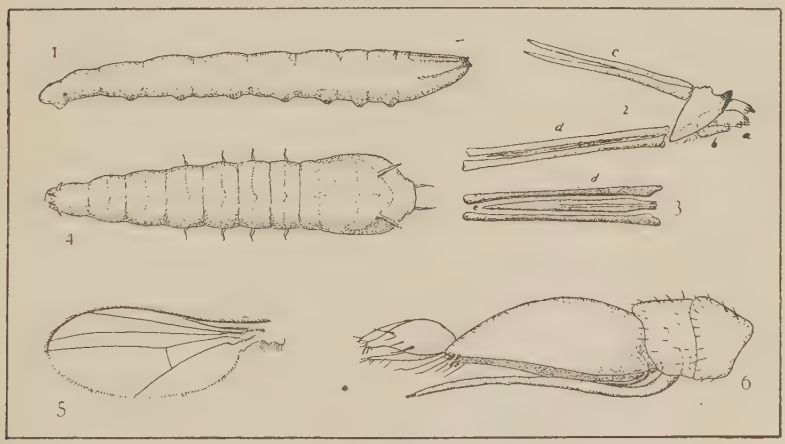

Fig. 1. *Thrypticus muhlenbergiæ* sp. nov.

1, larva, x 10. 2, pupa, x 12. 3, pharyngeal skeleton, side view, x 60. 4, pharyngeal skeleton, ventral aspect, x 60. 5, wing of male, x 20. 6, hypopygium, lateral aspect, x 150.

of 3-toothed mandibles (a), each one with an elongate supporting segment (b) and a small basal piece, and projecting caudad are six more elongate parts. Two of the dorsal pieces (c) are slender and rod-like, their caudal ends thin and wedge-shaped, between these is a thin, subtriangular piece; two of the ventral parts (d) are rod-shaped, slightly enlarged at each end, a little longer than the dorsal pieces; between these is a thin lanceolate piece (e).

Pupa (fig. 4). Length, 4 mm. Pale amber yellow in color. At the anterior end are two prominent cephalad projecting setæ; the elongate lanceolate thoracic respiratory organs are yellow. Seven segments may be distinctly seen in the abdomen, of which the first four are each provided with a curved pointed appendage, on each side ventrally; across the center of the dorsum of each of the first six abdominal segments is a transverse row of about 38 setulæ. The last segment is provided with four stout diverging spines.

Imago. Male and female. Length, 1.75 mm., without the hypopygium. Palpi pale yellow, face and front metallic blue, in some lights with a greenish tinge. Antennæ amber yellow, arista pubescent. Frontal setæ and those of thorax and abdomen pale yellow. Eyes sparsely pubescent, cilia of inferior orbit pale. Mesonotum and abdomen bright metallic green with bluish reflections, the former slightly pruinose, the latter with yellow hairs; scutellum metallic blue; prescutellar depression shallow; pleura metallic green, darker toward the base of the wings. Tegulæ pale yellow with pale hairs. Hypopygium (fig. 6) of the male fuscous, the appendages yellow; the basal sclerite which forms the capsule, elongate oval, the lamellæ pear-shaped with several conspicuous, pale, setæ. Ovipositor of the female ferruginous. Legs and coxæ pale yellow. Halteres yellowish. Wings hyaline with dusky yellow veins, venation as figured (fig. 5).

This species is distinguished from *T. willistoni*, by the structure of the hypopygium. Perhaps the yellow antennæ and the wholly yellow coxæ may also be of specific importance.

SOME ACALYPTRATE MUSCIDÆ[1]

By A. L. Melander

By an interesting coincidence Mr. J. R. Malloch, then of the United States National Museum, and I made an independent study of the small flies grouped about the Agromyzidæ. Mr. Malloch's paper on the genus *Agromyza* is to appear in the September issue of the Annals of the Entomological Society of America, while his discussion of the other genera is to come out in the Proceedings of the National Museum. The first installment of my paper was printed in the September issue of the Journal of the New York Entomological Society, which was received at the Bussey Institution, through the mails, on September 8. The remainder of this article, dealing with the Geomyzinæ is to appear in the December issue of that publication.

The following notes were made on a recent visit to the National Museum and to the Philadelphia Academy of Science, and are

[1] Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 73.

given as a supplement to my paper. While in Philadelphia I saw the proof sheets of Mr. Malloch's work, and while in Washington I examined his types.

1. *Scutops* Coquillett is not a Geomyzine. The post-vertical bristles are strongly divergent; the costa is nowhere fractured; the palpi are broadly spatulate; the first vein ends at the middle of the wing and the auxiliary vein, although rudimentary, is separated from the first vein, abruptly turning forward so as to terminate near the middle of the costal cell. In addition, the lack of oral vibrissæ, the presence of the clypeus, the single pair of reclinate fronto-orbital bristles, the stiff bristles of the front femora, the absence of preapical tibial bristles; and the shortened anal vein, support its relationships with the Lonchæinæ. The center of the face is broad and flat, obliterating the facial orbits below the antennæ. The face continues on the sides so as to line the mouth-opening; the cheeks thus consisting of the face, genæ and buccæ.

2. *Pseudiastata* Coquillett belongs with the Drosophilinæ. It possesses the following characters which are at variance with typical Geomyzinæ. The costa is fractured both at the humeral crossvein and at the end of the auxiliary vein, where there is a pronounced costal spine; the discal cell is confluent with the second basal; the single frontal bristle is proclinate; there are no mesopleural bristles; and the antennæ are spaced apart.

Mr. Coquillett was apt to over-stress some certain character, such as the vestiture of the arista, and as he relied much on his analytical keys, the microscopic pubescence of the arista of *Pseudiastata* led the genus to the Geomyzinæ. A similar instance occurred with *Sinophthalmus*, which presents more Drosophiline characters than it does Geomyzine. *Pseudiastata* has the anal cell present; the calypteres ciliate; the post-vertical bristles convergent; the oral vibrissæ present; the clypeus visible and moderately developed; the cheeks consisting of the genæ, buccæ and the sides of the face; the center of the face broad and flat; the front pubescent; and the propleural bristle lacking.

3. **Spilochroa punctipennis**, sp. nov.

Male. Length 2.5 mm. Cinereous, black; body not spotted. Cheeks, face and frontal orbits white-pollinose. Antennæ brown, the third joint blackish

except near the arista; arista with very short and close pubescence. Proboscis blackish, palpi whitish. Chætotaxy as in *ornata*, the bristles long and strong: two fronto-orbitals; ocellars almost reaching the root of the antennæ; postverticals moderately long and cruciate; oral margin of the narrow cheeks with a row of five hairs, with a strong vibrissa and with a strong bristle in back; five dorso-centrals, four rows of acrostichals with about a dozen setulæ in each; one humeral; two notopleural; three supra-alar; four scutellar; one mesopleural and two sternopleural, as well as a few mesopleural and sternopleural setulæ. Abdomen setulose as in *ornata*, and with an indication of a brownish median stripe. Halteres and calypteres white, the latter with a weak white fringe. Posterior legs yellowish, front coxæ dull whitish, remainder of the front legs blackish. Wings mostly hyaline, but marked with about two dozen pale brown spots, the largest of which occur at the end of the first vein, in the tip of the marginal cell and on the posterior cross-vein. The spots are aggregated in the same general pattern as in *ornata*, but are not nearly so confluent as in that species.

The type, collected by Professor T. D. A. Cockerell at Pecos, New Mexico, July 26, is in the National Museum. Two paratypes were taken by H. S. Barber at Las Vegas Hot Springs, New Mexico, August 11 and 18.

4. **Trixoscelis fumipennis**, sp. nov.

Male. Length 2.5 mm. Very close to the European *T. marginella* Fallen, but differs in that the paler portion of the first and second posterior cells is not oval in outline.

Head and thorax, largely brownish-gray pollinose; front except the orbits and the rounded ocellar triangle testaceous; orbits at the antennæ reddish; face and cheeks white-sericeous; cheeks two-thirds the eye-height; antennæ reddish, the third joint largely dusky above; arista black, its pubescence microscopic; palpi yellow, proboscis reddish. Ocellar bristles reaching to the base of the antennæ. Thorax with a median brown stripe and with less evident brown vittæ bearing the dorso-central bristles; humeri and pleuræ reddish, becoming paler below; center of the scutellum a trifle darker than the sides: abdomen shining black. Coxæ, front tibiæ and posterior legs testaceous; front femora and tarsi blackish. Halteres and calypteres white. Wings largely darkly infumated, but the base, including the auxiliary cell, a narrow streak in the submarginal cell above the anterior cross-vein, the anterior portion of the discal cell, a middle stripe in the first posterior cell extending to the wing-tip, the greater part of the second posterior cell, and the anal angle, nearly hyaline; costal spines black; anterior cross-vein slightly beyond the middle of the discal cell; sections of the fourth vein proportioned three to four, of the fifth vein six to one; posterior cross-vein slightly longer than the outer section of the fifth vein.

Five specimens: Aweme, Manitoba, N. Criddle, collector, June 12, 1911. The type is in the collection of the Philadelphia Academy of Science, number 6018. Paratypes are in the collections of Mr. Criddle and myself.

Malloch[1] has described the Arizona specimens of *costalis* Coquillett as *claripennis*. This is the species I have designated as *frontalis* Fallen, which is common throughout the Pacific states. Hendel's *Trixoscelis prima* is the same as *Parodinia cinerea* Coquillett.

5. *Hemeromyia* was described by Coquillett as near *Agromyza*. It proves to be the same as the Milichiine genus I described as *Paramadiza*. Malloch's species *Hemeromyia nitens* is the same as my *washingtona*. Curiously enough the name *Paramadiza* was selected also by Malloch, as a new generic name for *Madiza halteralis* Coquillett. As the name *Madiza* is now used for the Chloropine genus *Siphonella* Macquart, the species *halteralis* is without a generic name. (See Malloch, Canad. Entom., xlv., p. 177. June, 1913.) I would therefore suggest the appropriate name *Mallochiella* for this insect and for its European congeners. The identity of the Paramadizas may now thus be tabulated.

MALLOCHIELLA nomen novum.
halteralis Coquillett
Desmometopa (Coquillett)
Madiza (Hendel, Melander)
Paramadiza Malloch
HEMEROMYIA Coquillett.
obscura Coquillett
washingtona Melander
Paramadiza Melander
Syn: *Hemeromyia nitens* Malloch

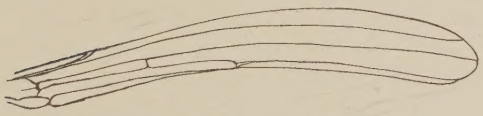

Fig. 1. *Mutiloptera apicalis* Coq., wing.

6. *Mutiloptera apicalis* Coquillett. This is a curious fly, whose body characters are evidently Geomyzine. The entire posterior portion of the wing is aborted as shown in the sketch.

September 19, 1913.

[1]The Genus *Parodinia* Coq. (Geomyzidæ). Malloch, J. R. Ent. New, xxiv. 274–276 (June, 1913)

MEROPE TUBER IN MASSACHUSETTS.

While collecting at Chester, Mass., July 25, 1913, I found a specimen of this interesting Mecopteron. The specimen was under a board on the dam of the little reservoir on Austen's Brook, and had only recently emerged. Mr. H. S. Barber in 1904 (Proc. Wash. Ent. Soc., VI, 50) gave sixteen records for this species. Another specimen was recorded by the writer in 1904 (Psyche, XI, 38). In the collection at the Bussey Institution is a specimen from Sullivan Co., N. Y., collected in August, 1905.

C. W. Johnson.

MANTISPA INTERRUPTA SAY IN NEW ENGLAND.

A specimen of this rare Neuropteron was captured by Mr. Edwin R. Jump, at Lake Boone, Stowe, Mass., July 13, 1913. It is apparently the first record for this species in New England. Described from Philadelphia in 1824, it was later recorded from Virginia by Uhler. It is recorded in Smith's Insects of New Jersey, 1909, from Lakehurst, July 4–30 and Lahaway in June. A specimen of *Mantispa brunnea* Say taken at Walpole, Mass., is also in the collection of the Boston Society of Natural History.

C. W. Johnson.

A QUESTION OF AUTHORSHIP.

Under the title "*Limosina mirabilis* Collin, a species of Borboridæ new to the United States," a short note appeared in Psyche, vol. 19, p. 199, under the signature of Malloch and Knab. The undersigned hereby declares that he had no share in the writing of this paper, knows nothing of the subject, and that his name was subjoined, not only against his wish, but in spite of his repeated objections made to Malloch. This does not affect the status of two other papers published by the above named authors,[1] as the undersigned has had a sufficient share in the work connected therewith. These two last mentioned papers are the only ones in which the authors have collaborated.

Frederick Knab.

[1] A borborid from an epiphytic bromeliad. (Ent. News, vol. 23, p. 413–415, 1912); New Australian Diptera from ants' nests. (Trans. Roy. Soc. S. Austral., vol. 36, p. 233–237, 1912.)

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